Acknowledgement by the PTO of the receipt of applicants' papers filed under Section 119 is noted.

Applicants affirm the oral election of Group II. The holding of the PTO that Groups I and II are patentably distinct from one another, i.e. patentable over one another, is now accepted. The non-elected claims 1-12 have now been deleted without prejudice to applicants' rights.

Claims 13-16 have been replaced with claim 17, and a series of new dependent claims 18-36 have been added, based on the original claims.

Prior to replying to the rejection of record, applicants would like to briefly set forth the essentials of the present invention.

The present invention relates to a process for mechanical chemical polishing of silicon oxide and/or silicon nitride surfaces wherein an abrasive composition comprising an aqueous acid suspension of (1) individualized colloidal silica particles not linked to each other by siloxane bonds **and (2) a surfactant** is used.

Under preferred conditions of implementation of the invention, the pH of the composition is between 1 and 5, preferably between 2 and 3.

As far as the size of the particles is concerned, a preferred average diameter of the abrasive individualized particles is between 12 and 100 nm, preferably 35 and 50 nm.

As cationic surfactants tend to destabilize the polishing composition, the surfactant is preferably non-ionic or anionic (see page 7, lines 20-26), particularly the latter.

Further, in the present invention, the use of a surfactant in the aqueous acid suspension allows the polishing speed of the silicon nitride to be reduced very considerably while preserving the polishing speed of the silicon oxide. In this regard, applicants' specification states as follows at page 7, lines 7-11:

> The surfactant used allows the polishing speed of the silicon nitride to be reduced very considerably whilst preserving the polishing speed of the silicon oxide. A selective polishing of the silicon oxide relative to the silicon nitride is thus obtained. It also allows the polishing speed of polymers with a low dielectric constant to be increased very considerably.

A selective polishing of the silicon oxide related to the silicon nitride is thus obtained (please also see example 1, test 4; example 2, test 9; example 11, test 3; and example 13 test 4). As stated above, the use of the surfactant further allows the polishing speed of polymers with a low dielectric constant to be increased very considerably (please also note example 5 of the present specification).

Accordingly, it surprisingly turns out that the presence of a surfactant as part of the liquid polishing composition very substantially increases the polishing performance, a result which could not have been reasonably expected from a consideration of the prior art, and certainly not a result which could have been predicted or foreseen.

Claims 13-16 have been rejected as obvious under §103 from Jacquinot et al 6,043,159 (Jacquinot '159) together with Robinson et al 5,733,176 (Robinson) and Chen Shian Shen EP 192047 (Chen). This rejection is respectfully traversed.

The closest prior art is clearly Jacquinot '159. Robinson is more remote. Chen merely discloses the use of a silicone surfactant as part of a **binder** in an abrasive grinder.

In more detail, Jacquinot discloses an abrasive similar to that of the present invention, and the corresponding chemical mechanical polishing process. However, the abrasive composition comprises **no surfactant.** As stated above, the addition of a surfactant provides unexpected effects which could not have been predicted or foreseen.

Chen Shian Shen discloses a chemical mechanical polishing composition comprising a high **open cell content polyurethane foam binder** in which is disposed a high concentration of abrasive particles. The abrasive particles

may be made of silica. No details are given about the type of silica used. Additionally, silica is one abrasive among 10 cited abrasives. Silica is not cited among the preferred abrasives which are aluminum oxide and silicon carbide.

The surfactant used in Chen is not any surfactant, but is specifically a **silicone** surfactant. Moreover, the silicone surfactant is part of the binder composition which forms the grinder, i.e. the fixed abrasive grinding medium used to enhance the properties of the binder, namely a thermoset polyurethane rigid foam. In particular, the surfactant "controls the size of the cell structure" of the polyurethane foam, as stated at page 4, lines 8 and 9 of Chen.

Thus, it is abundantly clear that Chen teaches a solid grinding composition based on polyurethane foam, and not the use of an aqueous acid suspension of silica particles. Attention is invited to the last part of the top paragraph on page 2 of Chen which, with reference to a prior U.S. patent, states as follows:

> [The prior art] shows a non-foamed elastomeric polyurethane binder in which abrasive particles are fixed. Media of this type does [*sic*] not absorb wetting solution during grinding which results in uneven surface cutting. The wetting ability of a grinding media is important, not only to produce a uniform surface, but also to prevent media wear.

To overcome this problem, Chen provides "a rigid thermoset, open cell polyurethane foam structure impregnated with 50 to 70 % abrasive particles…".

In this regard, Chen states as follows in the bottom paragraph on page 2:

> In accordance with the present invention, disk substrates are ground using a rigid thermoset, open cell polyurethane foam structure impregnated with 50 to 70 percent abrasive particles having a size ranging from 10 to 35 microns. This fixed abrasive grinding media is [sic] used, not with an abrasive slurry, but with a liquid lubricant or wetting solution. The foam matrix is characterized as being rigid, being highly thermosetting, having high abrasive particle loading, having a fine open celled structure and being non-compressible and non-friable. The impregnated foam composition may be used in the form of a block, a wheel or a sheet molded to any desired shape.

Thus, Chen not only teaches the use of a solid, rigid foam as the grinding medium, but also teaches against the use of "an abrasive slurry" as called for in applicants' claims.

The rigid foam structure disclosed and taught by Chen is based primarily on polyurethane as the main binder material, noting especially the third paragraph on page 5 of Chen. In addition to the polyurethane "in which abrasive particles are dispersed", the "binder may include catalysts, surfactant, blowing agent and additives to enhance the properties of the binder." **Applicants do not see the use of**

any other surfactant in Chen other than the surfactant used in the formation of the polyurethane foam!

Attention is further respectfully invited to the third paragraph on page 7 of Chen which states in part as follows:

> A silicone surfactant is used as a binder additive in the present invention. It controls the size of cell and also provides a desirable cell structure.

There is no teaching in Chen to use any surfactant at all in an aqueous acid suspension of colloidal silica particles, a key feature of applicants' claimed process.

The next question then is what the prior art in combination teaches those of ordinary skill in the art.

As recognized by the PTO, Jacquinot does not disclose the present invention because its compositions comprise no surfactant.

Chen Shian Shen discloses the use of a surfactant. However, as stated at page 5, third paragraph, the surfactant is in fact a part of the binder composition used to bind the abrasive in the manufacture of solid grinder. The surfactant is one of several possible optional compounds among catalysts, blowing agents and other additives.

Further, the function of the optional compounds is to enhance the properties of the binder. As stated page 7, second full paragraph, the silicone surfactant controls the

size of cells and also provides the desired cell structure which is able to retain the liquid lubricant.

Therefore, the person of ordinary skill in the art would have had no reason to combine Chen Shian Shen and Jacquinot since no open cell structure foam binder is used in the present invention.

First in this regard, the function of the surfactants of Chen Shian Shen is very different of the function of the surfactants of the present invention. In the present invention, as stated above, the surfactant enables a good polishing speed of silicon oxide relative to the polishing speed of silicon nitride.

The person skilled in the art seeking to obtain the present results would have had no incentive to combine the two references.

Furthermore, besides many other abrasive particles, a number of different colloidal suspensions of silica exist including neutral and basic suspensions. The person skilled in the art had no reason to select an acid composition to be combined with a surfactant disclosed by Chen Shian Shen.

Moreover, as quoted above from the bottom of page 2 of Chen, the Chen "fixed abrasive grinding media is used, **not** with an abrasive slurry,…" (emphasis added).

To briefly summarize, applicants respectfully maintain that the person of ordinary skill in the art would have no reason or purpose, no motive or incentive to combine Chen with Jacquinot '159 because they are fundamentally contrary to one another, Jacquinot '159 relying on an aqueous suspension and Chen relying on a solid grinder. Moreover, as regards the surfactant, Chen provides no reason or purpose to include any surfactant **in any polishing slurry**. Also, Chen actually teaches away from the proposed combination in its statement near the bottom of page 2 that its fixed abrasive grinding medium is not to be used with an abrasive slurry. The proposed combination therefore would not have been obvious to the person of ordinary skill in the art at the time the present invention was made.

Furthermore, applicants respectfully submit that even if the references were somehow combinable, the resultant combination would not correspond to what is claimed. Thus, if the two citations were somehow to be combined, the person of ordinary skill in the art would follow the strongest teachings of the citations. This would require use of Chen's rigid polyurethane foam in combination with the slurry of Jacquinot '159 (even though contrary to Chen's teaching at the bottom of page 2), and in such a case the silicone surfactant of Chen would be tied into the rigid structure of the foam and would

not be included in the slurry. This would not correspond to what is claimed.

Applicants note that the rejection also includes the Robinson patent, but applicants do not see that this citation adds anything to Jacquinot '159 and Chen. Certainly Robinson does not make up for the deficiencies pointed out above.

Lastly, the prior art provides no reasonable expectation of the improved polishing achieved according to the present invention and shown in applicants' examples. For example, as disclosed in comparative example 1, with a similar composition of pH 7, poor results were achieved. Also please again consider the comparative results set forth in examples 2, 11 and 13 as pointed out above.

Withdrawal of the rejection is in order and is respectfully requested.

Applicants have not at this stage argued the separate patentability of any of the dependent claims. These are patentable because they depend from patentable claim 17. Briefly, however, it should be additionally noted that claims 18 and 19 (and of course the claims which depend therefrom) call for particular types of surfactants. Chen, on the other hand, only mentions silicone surfactants.

The additional documents cited of record and not relied upon have been noted, along with the implication that such documents are deemed by the PTO to be insufficiently pertinent to warrant their application against any of applicants' claims.

Applicants accordingly and respectfully request favorable reconsideration and allowance.

Respectfully submitted,

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